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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/033,349	11/02/2001	Yu-Chen Shen	M-11972 US	7168

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EXAMINER	
WILLE, DOUGLAS A	

ART UNIT	PAPER NUMBER
2814	

DATE MAILED: 02/19/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/033,349	SHEN ET AL.	
	Examin r	Art Unit	
	Douglas A Wille	2814	

-- The MAILING DATE of this communication appears on the cov r sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 January 2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-17 and 19-28* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-17 and 19-28* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1, 6, 7, 9, 11, 13, 14, 16, 17, 20, 22 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sasanuma et al. in view of Svedlov.

3. With respect to claim 1, Sasanuma et al. show (see Figures 5, 6, 7 and column 2, line 3 et seq.) a laser diode with a substrate 1, a first type layer 3, an InGaN layer 14, an AlGaN layer 15, and InGaN MQW layer 16, an AlGaN layer 17, an InGaN layer 18, a GaN layer 8 and a second type layer 9. The InGaN MQW has the smallest band gap, layer 15 has In and layers 8 and 14 are GaN (x = 0). Note that Sasanuma et al. shows the In ratio as being in the range of 0 to 1 (column 1, lines 32 and column11, line 2) which covers the claimed range. Note also that the layers corresponding to the spacer and cap layers have larger bandgaps than the quantum well layer and the layers corresponding to the confinement layers have larger bandgaps than the spacer and cap (see Figure 5) and the spaacer and cap have In. Sasanuma et al. show layers 15 and 17 as AlGaN and Sverdlov shows that AlGaN can be avoided by using GaN instead (see abstract) to improve the device as shown in the abstract. It would have been obvious to use the GaN as shown by Sverdlov to gain the advantage shown.

4. With respect to claims 16 and 17, Sverdlov shows y is in the range 0.1 – 0.25 (column 4, line 37) and is greater than x. Thus x is in the claimed range.

5. With respect to claim 6, the QW has the smallest band gap.

6. With respect to claim 7, x = 0.

7. With respect to claim 9, layers 16 and 24 of Sverdlov are 1000 – 5000 angstroms thick (column 5, line 10) and the use of such a thickness would be obvious since it is known to be functional.

8. With respect to claim 11, layer 8 is GaN and x = 0.

9. With respect to claim 13, Sverdlov shows Mg as a dopant (column 7, line 36).

10. With respect to claim 14, Sasanuma et al. do not show the thickness of layers 8 and 14 but it would be obvious to make the layers thick enough to prevent tunneling and not so thick that a large series resistance is introduced. Based on this it would be obvious to use a range of values of order of magnitude 100 – 10,000 angstroms.

11. With respect to claim 20, layer 18 of Sasanuma et al. is p-type.

12. With respect to claim 22, Sasanuma et al. do not show the type 1 and type 2 layers as having a greater bandgap than the clad equivalent layers but in view of the descending bandgap sequence shown for the other layers and the importance to using the descending gap sequence it would have been obvious to provide the same relationship for the outer two layers to prevent an increase in resistance of the device.

13. With respect to claim 23, the spacer and cap equivalent layers have a greater bandgap than the barriers with AlGaN (see figure 5) and the barrier gap will be lowered further with the use of InGaN for the barriers.

14. Claims 2, 3, 5, 10, 15 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sasanuma et al. in view of Svedlov and Bour et al.

15. With respect to claim 2, Sasanuma et al. and Svedlov fail to show that all the layer have In but Bour et al. show a similar device (see cover figure and abstract) where the GaN layers are replaced with InGaN to prevent the deleterious effects of lattice mismatch. It would have been obvious to include In in all the layers as shown by Bour et al. for the advantages shown.

16. With respect to claim 3, Sverdlov shows y is in the range 0.1 – 0.25 (column 4, line 37) and is greater than x. Thus x is in the claimed range.

17. With respect to claim 5, Sasanuma et al. do not show the layer thickness and only state that the AlGaN layer is less than 50 nm (column 13, line 11). Sverdlov show the well and barrier layers as 20 – 150 Angstroms (column 5, line 6). It would have been obvious to use these values since they are known to be functional.

18. With respect to claims 10 and 15, see Figure 5 of Sasanuma et al.

19. With respect to claim 28, the spacer and cap equivalents have more In than the barriers or else the barriers would not be barriers.

20. Claim 4 is rejected under 35 U.S.C. 102(b) as being anticipated by Sasanuma et al. in view of Sverdlov and Bour et al. and further in view of Koide et al.

21. With respect to claim 4, Neither Sasanuma et al. nor Sverdlov show doping levels but Koide et al. show doping of layer 3b to $2(10)^{17}$ (column 4, line 43). It would have been obvious to use a doping level near this value since it is known to be functional.

22. Claims 8, 12 and 21 are rejected under 35 U.S.C. 102(b) as being anticipated by Sasanuma et al. in view of Sverdlov and further in view of Koide et al.

23. With respect to claim 8 and 12, the doping level shown by Koide et al. is regarded as nominal and its use would be obvious.

24. With respect to claim 21, Sasanuma et al. do not show the doping of layer 15 but Koide et al. show that, for instance, layer 7a is doped. It would be a design choice to dope layer 15 and by doping the layer its resistance would be reduced. Thus it would have been obvious to dope layer 15 and to use the nominal doping level.

25. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sasanuma et al. in view of Svedlov and further in view of Duggan.

26. Sasanuma et al. and Sverdlov show a device with layers of different composition and Duggan shows (see abstract) that lattice mismatch between layers of an optoelectronic device causes dislocations and that grading the layers reduces the dislocations (column 4, line 1). It would have been obvious to use graded layers in the basic device to reduce dislocations and improve the function of the device.

27. Claims 24 - 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sasanuma et al. in view of Svedlov and further in view of Schetzina.

28. The basic references do not show grading but Schetzina shows (see cover Figure and abstract) that for a similar device, using graded layers prevents conduction or valence offsets. It would have been obvious to provide graded layers as shown by Schetzina for the benefit shown.

Response to Arguments

29. Applicant's arguments filed 1/16/03 have been fully considered but they are not persuasive. Applicant's arguments related to claim 1 are addressed to the amended claim and are dealt with above but it is noted that Applicant seems to misunderstand the function of the barriers

in both the claimed device and the prior art quoted. The barriers must have a wider bandgap than the quantum well layer but these layers are not the cap or confinement layers and the use of InGaN for the barrier layers would, of necessity, be of sufficient height to still function as barriers.

30. Comments relative to claim 2 are directed to the amended claim are addressed above.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Douglas A Wille whose telephone number is (703) 308-4949. The examiner can normally be reached on M-F (6:15-3:45).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (703) 308-4918. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Douglas A. Wille
Patent Examiner

daw
February 14, 2003